US009318855B2

(12) **United States Patent**
Miyakawa

(10) **Patent No.: US 9,318,855 B2**
(45) **Date of Patent: Apr. 19, 2016**

(54) **CONNECTOR**

(71) Applicant: **Yazaki Corporation**, Tokyo (JP)

(72) Inventor: **Daisuke Miyakawa**, Susono (JP)

(73) Assignee: **Yazaki Corporation**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/790,470**

(22) Filed: **Jul. 2, 2015**

(65) **Prior Publication Data**

US 2016/0020564 A1 Jan. 21, 2016

(30) **Foreign Application Priority Data**

Jul. 17, 2014 (JP) 2014-146889

(51) **Int. Cl.**

H01R 13/40	(2006.01)
H01R 24/38	(2011.01)
H01R 13/422	(2006.01)
H01R 13/436	(2006.01)
H01R 107/00	(2006.01)

(52) **U.S. Cl.**

CPC ***H01R 24/38*** (2013.01); ***H01R 13/4223*** (2013.01); *H01R 13/4362* (2013.01); *H01R 2107/00* (2013.01)

(58) **Field of Classification Search**

USPC 439/595

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,565,416	A *	1/1986	Rudy	H01R 13/4364 439/592
4,714,437	A *	12/1987	Dyki	H01R 13/4364 439/595
4,971,579	A *	11/1990	Mobley	H01R 13/4361 439/592
7,387,545	B2 *	6/2008	Tyler	H01R 13/4365 439/595
8,408,950	B2 *	4/2013	Jeon	H01R 13/4365 439/595

FOREIGN PATENT DOCUMENTS

JP 2004-273374 A 9/2004

* cited by examiner

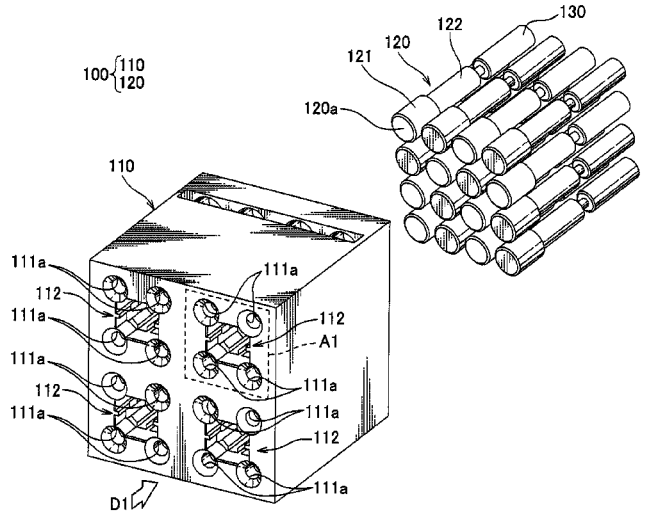
Primary Examiner — Tho D Ta

(74) *Attorney, Agent, or Firm* — Locke Lord LLP

(57) **ABSTRACT**

A connector having a housing is disclosed. The housing of the connector includes a receiving chamber group having four terminal receiving chambers in which a terminal is inserted, and a lance body surrounded by the four terminal receiving chambers. Each of the four terminal receiving chambers is arranged so that each axis thereof is positioned in four vertexes of a square. The lance body integrally has four flexible lances arranged corresponding to each four terminal receiving chambers. Each of the four flexible lances has a locking portion. Further, each the four flexible lances is arranged in a diagonal line so that the free end is bent in a diagonal direction of the square when inserting/extracting the terminal into the terminal receiving chamber and the locking portion is locked or unlocked on the step of the terminal.

4 Claims, 9 Drawing Sheets



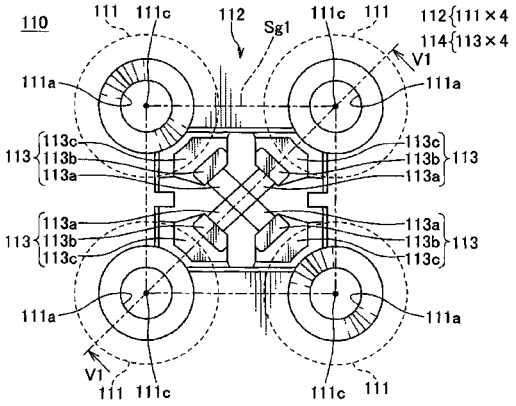


FIG. 1

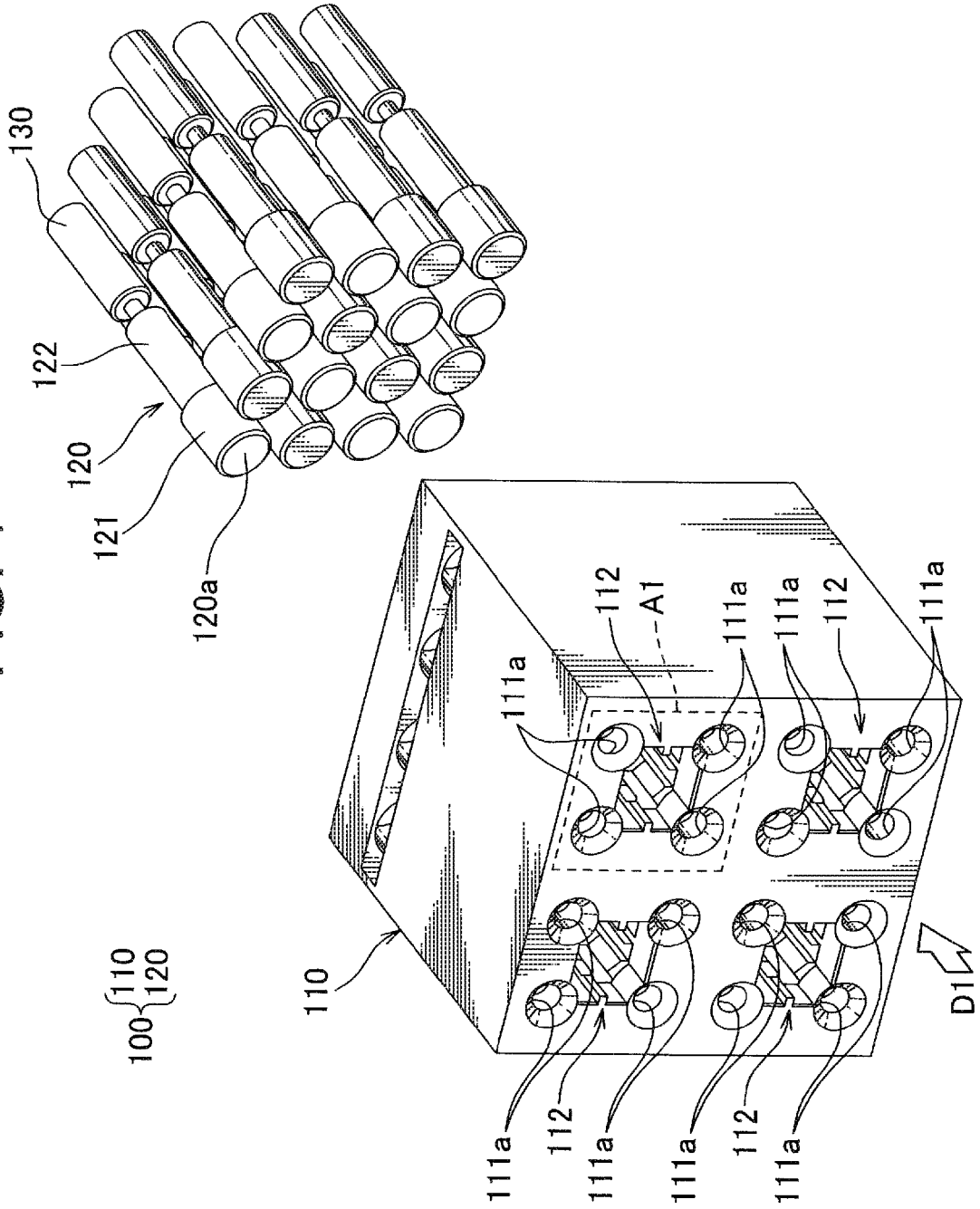

130
122
120
121
120a
112
A1
111a
111a
112
111a
111a
110
100
110
120
111a
112
111a
111a
112
111a
D1

FIG. 2

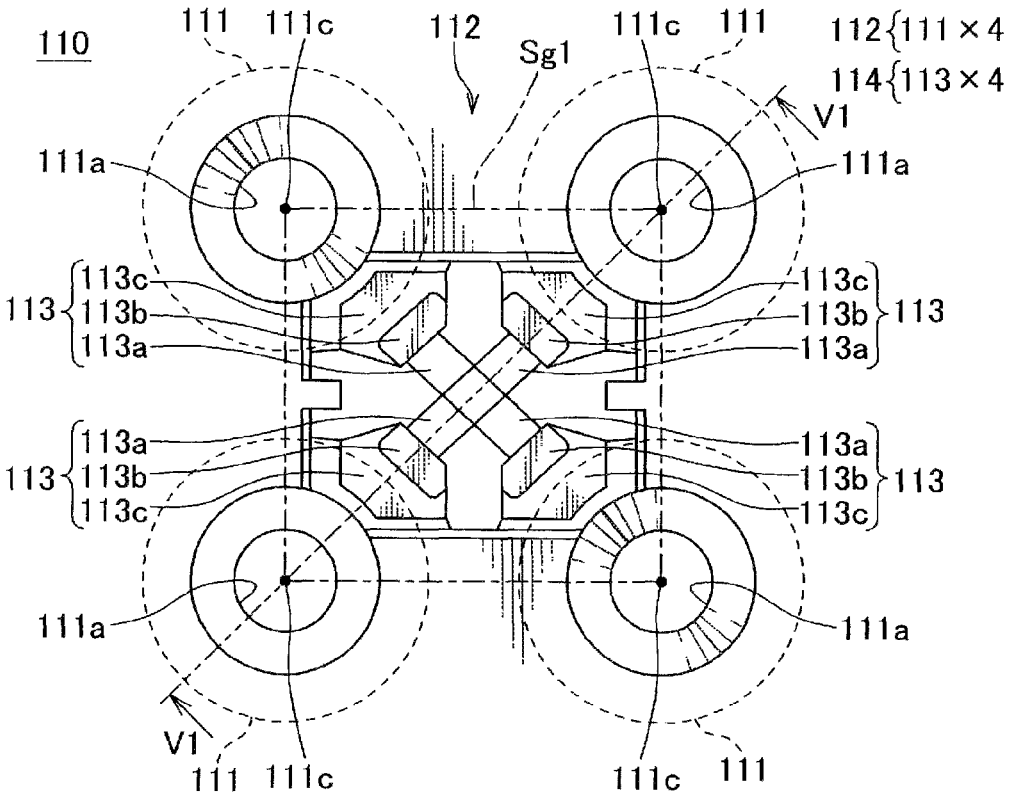

110
111
111c
112
Sg1
111c
111
112{111×4
114{113×4
V1
111a
111a
113
113c
113b
113a
113c
113b
113a
113
113
113a
113b
113c
113a
113b
113c
113
111a
111a
V1
111
111c
111c
111

FIG. 3

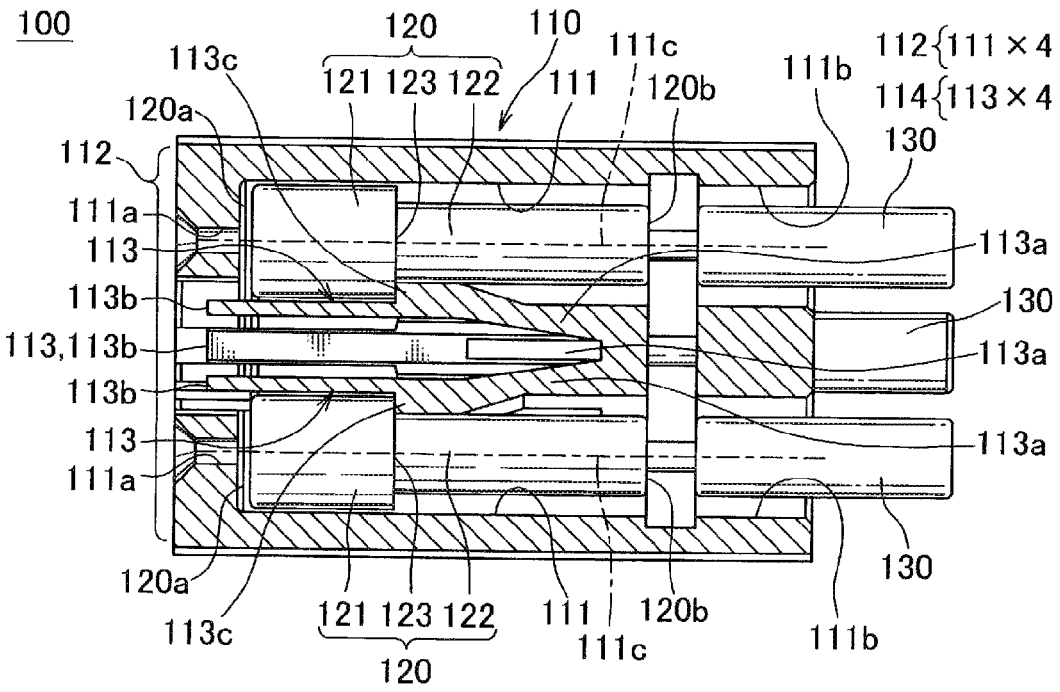

100
120
110
111c
112{111×4
114{113×4
113c
121 123 122
111
120b
111b
120a
130
112
111a
113
113a
113b
130
113,113b
113a
113b
113
113a
111a
130
120a
113c
121 123 122
111
120b
111b
111c
120

FIG. 4B

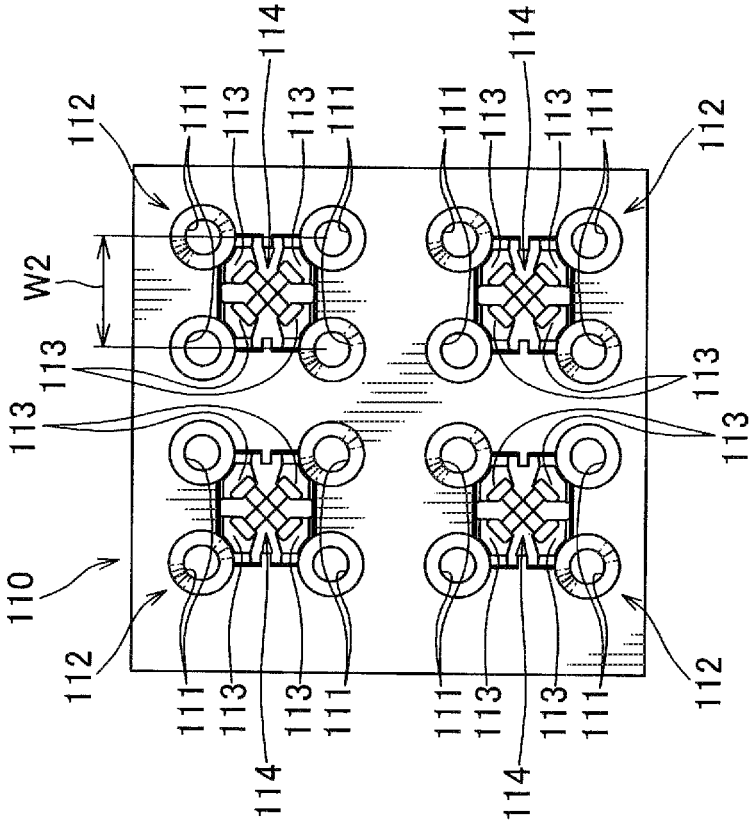


FIG. 4A

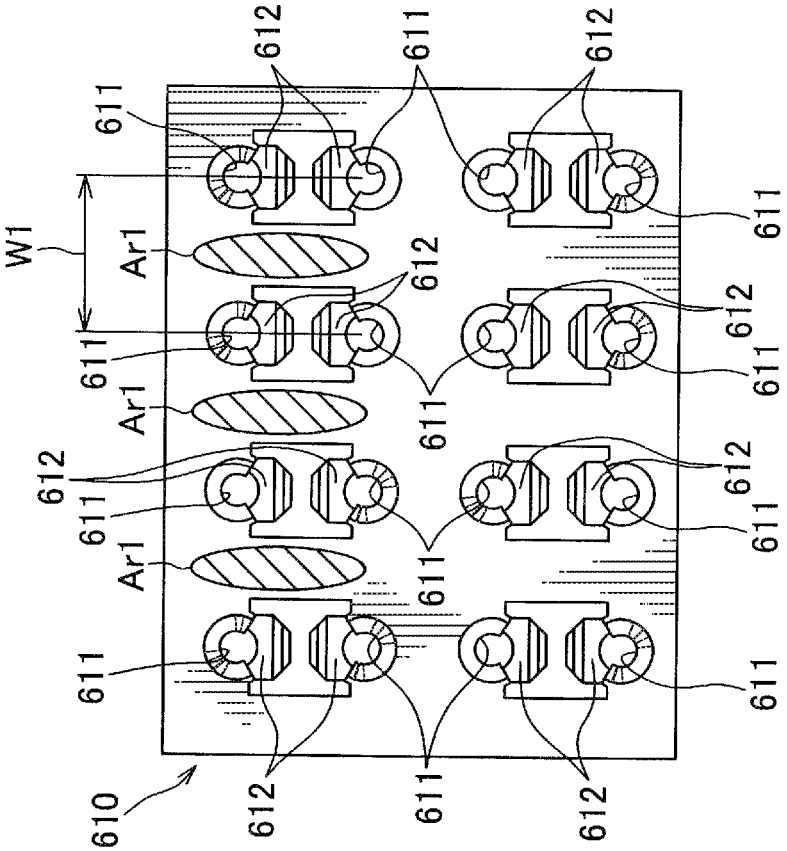


FIG. 5B

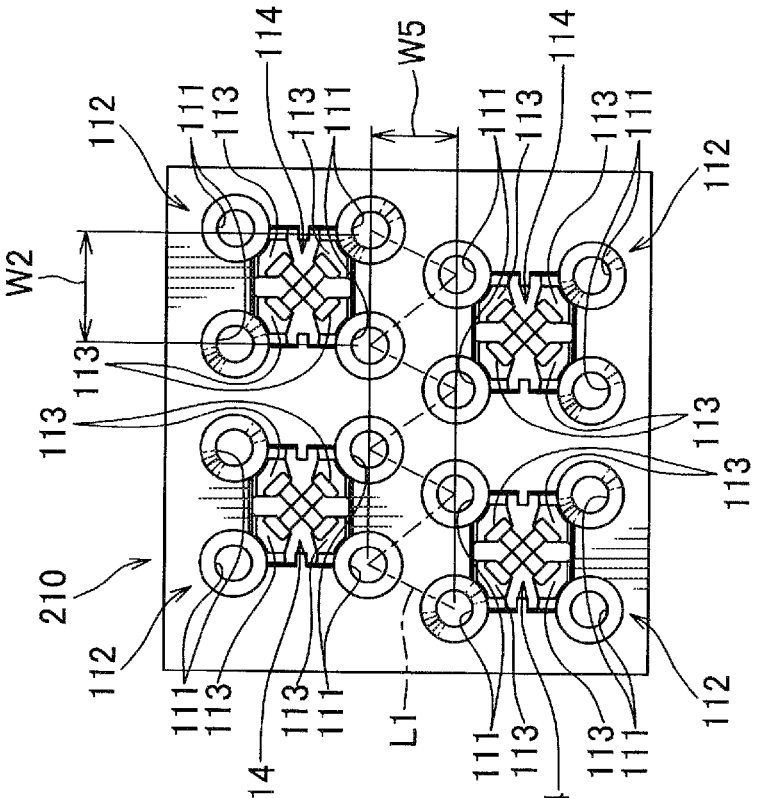


FIG. 5A

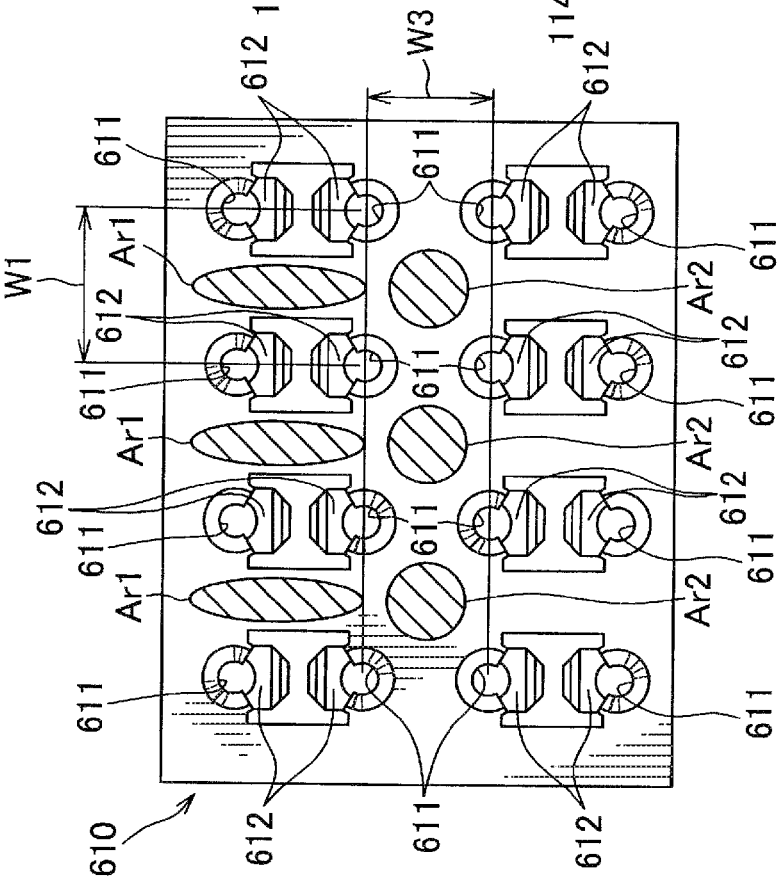


FIG. 6

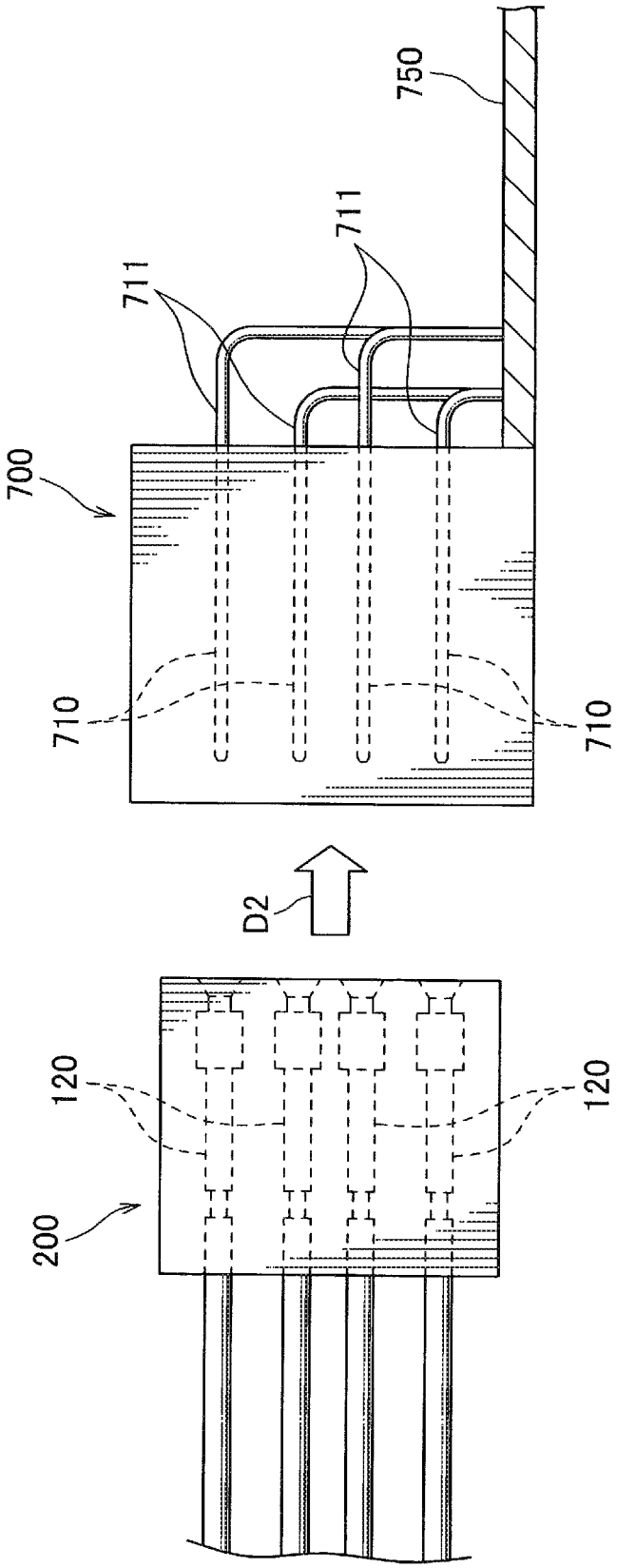


FIG. 7

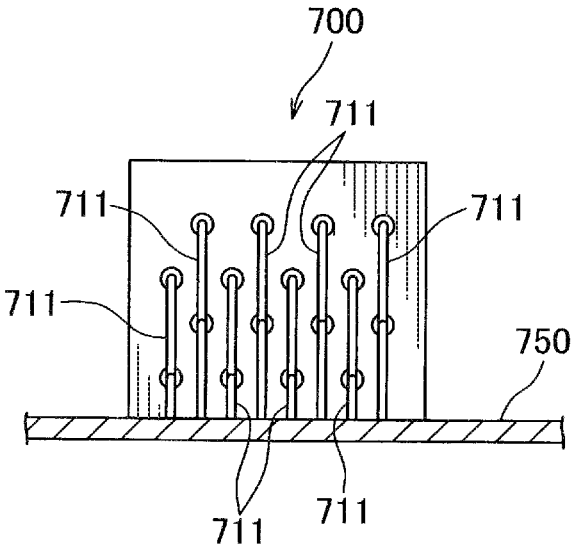


FIG. 8A

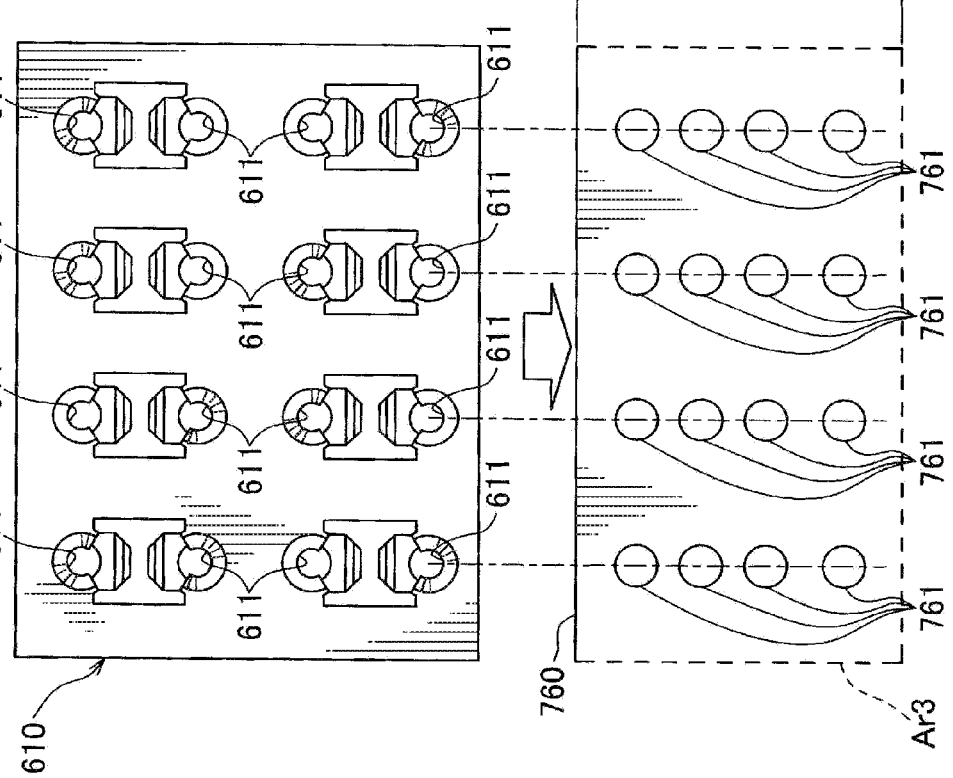


FIG. 8B

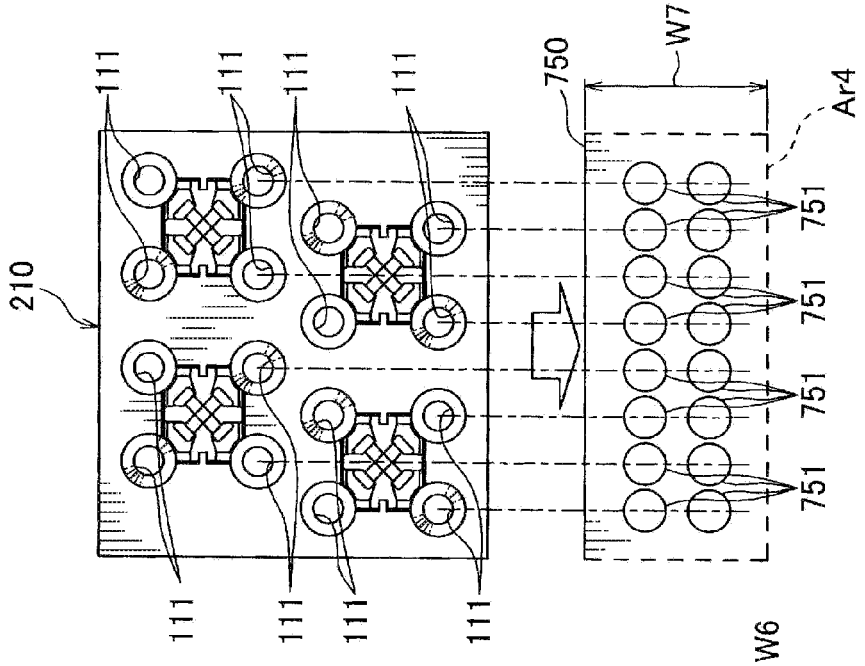
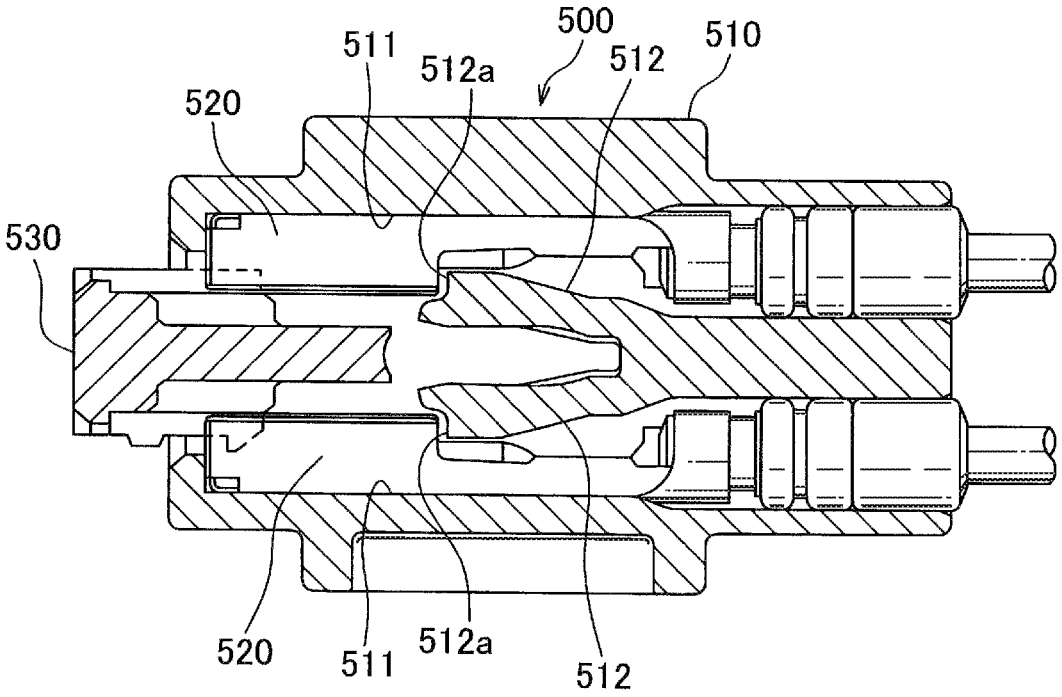


FIG. 9
PRIOR ART



CONNECTOR

TECHNICAL FIELD

The present invention relates to a connector arranged in a terminal of a wire harness.

BACKGROUND OF THE INVENTION

Various electronic devices are mounted on a vehicle as a moving object. Those electronic devices are connected with a wire harness so as to transmit electric power or control signal between them. The wire harness has an electric wire bundle in which a plurality of electric wires are bundled, and a connector attached to the terminal of the electric wire bundle. (For example, see Patent Document 1). Also, many of connector has a structure including a terminal of which a mating terminal is fitted to one end and an electric wire is connected to the other end, and a housing receiving a plurality of the terminals.

FIG. **9** shows the structure of a conventional connector as an example. In the connector **500** shown in FIG. **9**, a terminal **520** is housed in a cylindrical-shaped terminal receiving chamber **511** arranged in a housing **510** in a state that the terminal **520** is retained. The retaining of the terminal **520** is performed by a flexible lance **512** arranged in the housing **510**. The flexible lance **512** is positioned adjacent to the terminal receiving chamber **511**, extends in a longitudinal direction of the terminal receiving chamber **511**, and is a flexible member. One end of the flexible lance **512** is a free end. A part of the flexible lance **512** at the free end side is a locking portion **512***a* projecting into the inside of the terminal receiving chamber **511** so that the part of the flexible lance **512** is locked on the terminal **520** in the terminal receiving chamber **511** and retained. When inserting the terminal **520** into the terminal receiving chamber **511** or when extracting from the terminal **520** after inserted into the terminal receiving chamber **511**, the flexible lance **512** is bent to the outside of the terminal receiving chamber **511**, and the locking portion **512***a* is locked or unlocked on the terminal **520**. Furthermore, the tip of the terminal **520** in the terminal receiving chamber **511** is supported with a front holder **530** attached to the housing **510**.

Also, in the connector **500** shown in FIG. **9**, two flexible lances **512** are arranged adjacent to two terminal receiving chambers **511**, respectively, and integrally formed at the end portion of the right side in FIG. **9**. Further, two flexible lances **512** are located in a back-to-back position so that two flexible lances **512** are bent in a mutually approaching direction when inserting or extracting the terminal **520**. Two flexible lances **512** are formed in the back-to-back, and thereby a space between two terminal receiving chambers **511** can be shorted. As a result, the size of the connector **500** can be reduced.

CITATION LIST

Patent Literature

Patent document 1: Japanese Patent Application Publication No. 2004-273374

SUMMARY OF THE INVENTION

Recently, further miniaturization of a connector used for a wire harness is required, and it is difficult to meet such requirements with the structure as described with reference to FIG. **9**.

Accordingly, an object of the present invention is to provide a connector with further downsizing.

In order to attain the above object, a connector of the present invention has a large-diameter portion and a small-diameter portion formed in cylindrical shape and continued in an axial direction; and a housing for receiving a plurality of the terminals. The housing has a receiving chamber group including four terminal receiving chambers extending from one end of the housing toward the other end thereof and in which the terminal is inserted with the large-diameter portion as a leading end from an opening provided in the other end; and a lance body arranged to be surrounded by the four terminal receiving chambers. Each of the four terminal receiving chambers of the receiving chamber group is arranged so that each axis of the terminal receiving chambers is parallel to each other and is located on four vertexes of a square or rectangle when viewing from the axis direction. The lance body is arranged corresponding to each the four terminal receiving chambers and integrally has four flexible lances extending in a longitudinal direction of the terminal receiving chamber, one end of each the flexible lance is formed to be a free end in the one end of the housing. Each the four flexible lances has a locking portion projecting into an inside of the terminal receiving chamber so as to be locked on a step between the large-diameter portion and the small-diameter portion in the terminal received in the corresponding terminal receiving chamber. Further each the four flexible lances is located in a diagonal line of the square or rectangle so that the free end is bent in a diagonal direction of the square or rectangle and the locking portion is locked or unlocked on the step when the terminal is inserted in the terminal receiving chamber or extracted therefrom.

Preferably, according to a second aspect, the free end of the flexible lance extends toward the one end of the housing over the step, and supports the large-diameter portion in the diagonal direction.

Preferably, according to a third aspect, a plurality of the receiving chamber groups are provided. One of the plurality of the receiving chamber groups and the other of the plurality of the receiving chamber groups are arranged opposite to each other with a space in one direction. The axis of the terminal receiving chamber of the one of the plurality of the receiving chamber groups and the axis of the terminal receiving chamber of the other of the plurality of the receiving chamber groups are arranged so as to be shifted in a direction perpendicular to the one direction.

According to the present invention, the lance body integrally has the four flexible lances bent in the diagonal direction of the square or rectangle. Thereby, spaces between the four terminal receiving chambers which surround the lance bodies in the vertical and horizontal two directions in the receiving chamber group can be reduced. As a result, the housing can be downsized, and thereby the connector can be more downsized.

Further, according to the present invention, the free end of the flexible lance extends toward the one end of the housing over the step. For this reason, when the two flexible lances located in a face-to-face position are bent in the diagonal direction, the free ends extending as mentioned above abuts on each other between the two flexible lances. By the abutment, excessive flexure of the flexible lance can be restricted. Furthermore, since the free end extending in this way supports the large-diameter portion of the terminal, another member for supporting the terminal such as the front holder **530** shown in FIG. **9** is not required, and thereby a number of parts can be reduced.

Further, according to the present invention, the axis of the terminal receiving chamber of the one of the plurality of the receiving chamber groups and the axis of the terminal receiving chamber of the other of the plurality of the receiving chamber groups are arranged so as to be shifted in a direction perpendicular to the one direction. As a result, spaces between them in the one direction can be reduced, and thereby the connector can be more downsized.

Also, a connector which is mounted on an edge of a substrate and is fitted in a substrate surface direction is considered as a mating connector. In many of such type of the connectors, one side opposite to the other side fitted to the terminal is a connecting pin. The connecting pin extends parallel to the substrate, is bent at 90 degrees, and then is connected to the substrate. At this time, it is assumed that the terminal is arranged in lattice points. In this case, since the connecting pin extending from the terminal is arranged parallel to each other and is connected to the substrate through a path, a connecting point on the substrate is arranged in the lattice points and an area on the substrate is occupied by the amount of the sequence.

On the other hand, according to the present invention, the horizontal direction parallel to the substrate is adopted as a direction shifting the axis of the terminal receiving chamber. So, the terminal in the mating connector can be arranged as below. More specifically, in response to the terminal receiving chamber of one of the plurality of the receiving chamber groups and the other of the plurality of the receiving chamber groups, the terminal arranged opposite to each other with a space in the vertical direction can be arranged so as to be shifted in the horizontal direction. Thus, the connecting point of the connecting pin extending from the terminal on the substrate can be arranged side by side in a row without a space in the vertical direction. As a result, the occupied area on the substrate can be reduced. The above and other objects and features of this invention will become more apparent from the following description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view showing a connector which is divided into a housing and a round terminal according to first embodiment;

FIG. **2** is an enlarged front view of an area A**1** in FIG. **1** when viewed in a direction of arrow D**1**;

FIG. **3** is a cross-sectional view of the housing and the round terminal received in the housing taken along the V**1**-V**1** in FIG. **2**;

FIGS. **4**A and **4**B are views showing a state that miniaturization of the housing can be achieved by the structure of a flexible lance;

FIG. **4**A shows a housing of a comparison example against a housing of the present invention according to the first embodiment;

FIG. **4**B shows a housing of the present invention according to the first embodiment;

FIG. **5**A shows a housing of a comparison example against a housing of the present invention according to second embodiment;

FIG. **5**B shows a housing of the present invention according to the second embodiment;

FIG. **6** is a view showing a substrate mounting type of a connector fitted to the connector of the second embodiment;

FIG. **7** is a view seeing the substrate mounting type of the connector shown in FIG. **6** from a substrate side;

FIGS. **8**A and **8**B are views showing a state that an occupied space on the substrate in the substrate mounting type of the connector shown in FIGS. **6** and **7** is narrowed by the arrangement of the terminal receiving chamber in the connector fitted to the connector; and,

FIG. **9** is a view showing one example of a conventional connector structure.

DESCRIPTION OF THE PREFERRED EMBODIMENT

(First Embodiment)

A connector according to first embodiment of the present invention will be explained with reference to FIGS. **1** to **4**. The connector **100** of the first embodiment has a quadrangular-shaped housing **110** and a round terminal **120** (terminal). FIG. **1** shows a perspective view of the connector **100** which is separated into the housing **110** and the round terminal **120** of the first embodiment of the present invention. FIG. **2** shows an enlarged front view of an area A**1** in FIG. **1** when viewing in a direction of arrow D**1**. FIG. **3** shows a cross-sectional view of the housing **110** taken along V**1**-V**1** of FIG. **2** together with the round terminal **120** received in the housing **110**.

As shown in FIGS. **1** to **3**, the round terminal **120** is formed in cylindrical shape, and is a female terminal. A mating male terminal not shown is fitted to one end **120***a* of the round terminal **120**, and an electrical wire **130** is connected to the other end **120***b* thereof. Further, the one end **120***a* of the round terminal **120** is a large-diameter portion **121**, and the other end **120***b* is a small-diameter portion **122**.

The housing **110** receives sixteen round terminals **120**. As shown in FIG. **3**, the housing **110** includes sixteen terminal receiving chambers **111** which respectively receive the round terminal **120**. Each terminal receiving chamber **111** extends from one end of the housing **110** to the other end thereof, and is formed in a cylindrical shape. Further, each terminal receiving chamber **111** has a fitting hole **111***a* for fitting the mating male terminal and a insertion/extraction hole **111***b* for inserting/extracting the round terminal **120**. The fitting hole **111***a* is opened in the one end of the housing **110**, and the insertion/extraction hole **111***b* is opened in the other end thereof.

In the housing **110**, four terminal receiving chambers **111** are arranged, and constitute a receiving chamber group **112**. The receiving chamber group **112** is arranged so that each the axis **11***c* is parallel to each other and is positioned at the four corners of a square Sg**1**. Four the receiving chamber groups **112** are provided in the housing **110**.

As shown in FIGS. **2** and **3**, a lance body **114** is arranged in an area surrounding by four terminal receiving chambers **111** in each the receiving chamber group **112**. The lance body **114** integrally has four flexible lances **113** for retaining the round terminal **120** in each the terminal receiving chamber **111**. Each the flexible lance **113** is located close to the terminal receiving chamber **111** on the center side of the square Sg**1** and extends in a longitudinal direction of the terminal receiving chamber **111**. Further, the flexible lance **113** has a fixed end **113***a* which is provided on the insertion/extraction hole **111***b* side of the terminal receiving chamber **111**, and a free end **113***b* which is provided on the fitting hole **111***a* side. Furthermore, a part of the flexible lance **113** is a locking portion **113***c* projecting into the terminal receiving chamber **111**. The locking portion **113***c* is locked on a step **123** between the large-diameter portion **121** and the small-diameter portion **122** on the round terminal **120** in the terminal receiving chamber **111**, and thereby it serves as a stopper.

Each of the four flexible lances **113** is placed diagonally to the square Sg**1** so that the free end **113***b* is bent in a diagonal

direction of the square Sg**1** and the locking portion **113***c* is locked or unlocked on the step **123** when inserting/extracting the round terminal **120** in the terminal receiving chamber **111**. More specifically, when inserting the round terminal **120**, the locking portion **113***c* is retracted from the terminal receiving chamber **111**, the large-diameter portion **121** passes through the locking portion **113***c* in the terminal receiving chamber **111**, and the locking portion **113***c* is locked on the step **123** after the large-diameter portion **121** passes through the locking portion **113***c*. Further, when extracting the round terminal **120**, the locking portion **113***c* is retracted from the terminal receiving chamber **111**, and engagement of the locking portion **113***c* and the step **123** is canceled.

According to the first embodiment of the present invention, the four flexible lances **113**, which are respectively arranged in the four terminal receiving chamber **111** forming the receiving chamber group **112**, are integrally formed on the fixed end **113***a*. Thereby, the lance body **114** consisting of the four flexible lances **113** is radially branched toward each the vertex of the square Sg**1**, and is formed with a structure that the tip of each branch becomes the free end **113***b*. Furthermore, each the free end **113***b* of two flexible lances **113** is arranged in a diagonal line of the square Sg**1**. The two flexible lances **113** are bent in a direction approaching to each other when inserting/extracting the round terminal **120**, and are located on a back-to-back position, and are a pair.

According to the first embodiment of the present invention, the miniaturization of the housing **110** can be achieved by the structure of four flexible lances **113** in the lance body **114**, and thereby it is possible to reduce the size of the connector **100**. FIG. **4** is a view showing a state that the miniaturization of the housing **110** is achieved by the structure of four flexible lances **113** in the lance body **114**. FIG. **4**A shows a comparative example housing **610**, and FIG. **4**B shows the housing **110** of the first embodiment of the present invention.

The comparative example housing **610** shown in FIG. **4**A, as described with reference to FIG. **9**, is formed so that two flexible lances **612** which are respectively arranged close to two terminal receiving chambers **611** arranged in a vertical direction of FIG. **4**A are located in a back-to-back position. In the comparative example housing **610**, a space between the terminal receiving chambers **611** is shortened in the vertical direction of FIG. **4**A since two flexible lances **612** are formed with a back-to-back positional relation. On the other hand, regarding to a horizontal direction of FIG. **4**A, a space Ar**1** is required so as to arrange the flexible lance **612**, and a space W**1** between the terminal receiving chambers **611** includes the space Ar**1**.

In contrast, the housing **110** of the first embodiment of the present invention shown in FIG. **4**B has the lance body **114** surrounded in four terminal receiving chambers **111** forming the receiving chamber group **112**. Four flexible lances **113** of the lance body **114** are integrally formed so that a pair of the flexible lances **113** on the diagonal line of the square Sg**1** is bent back-to-back. For this reason, in the housing **110** of the present invention, the space Ar**1** shown in FIG. **4**A is not required in the horizontal direction of FIG. **4**B. Further, the housing **110** of the present invention can reduce a space between two terminal receiving chambers **111** in the diagonal line of the square Sg**1**, and each space between four terminal receiving chambers **111** in the vertical and horizontal two directions. As a result, a space W**2** between the terminal receiving chambers **111** is shorter than the space W**1** shown in FIG. **4**A. Thus, according to the present invention, each of the space between the terminal receiving chambers **111** forming the receiving chamber group **112** can be reduced in the two directions in height and width. Thereby the housing **110** can be downsized, and the connector can be more downsized.

Also, in the first embodiment of the present invention, as shown in FIG. **3**, the locking portion **113***c* for performing a function as retaining by locking on the step **123** of the round terminal **120** is located near the center of the flexible lance **113**. The free end **113***b* of each flexible lance **113** extends in the fitting hole **111***a* side beyond the step **123**, and supports the large-diameter portion **121** of the round terminal **120** in a diagonal direction of the square Sg**1**.

For this reason, when two flexible lances **113** located in a face-to-face position in the diagonal direction are bent, the free ends **113***b* extending as mentioned above abut on each other between two flexible lances **113**. By the abutment, excessive flexure of the flexible lance **113** can be restricted. Furthermore, since the free end **113** extending in this way supports the large-diameter portion **121** of the round terminal **120** as shown in FIG. **3**, another member such as the front holder **530** shown in FIG. **9** is not required, and thereby a number of parts can be reduced.

(Second Embodiment)

Next, a connector **210** according to second embodiment of the present invention will be explained with reference to FIGS. **5** to **8**. The connector of the second embodiment of the present invention is equal to the connector **100** of the first embodiment of the present invention except for the arrangement of the terminal receiving chamber **111** in the housing. The connector of the second embodiment will be explained by focusing on differences from the connector **100** of the first embodiment in the following.

FIG. **5** is a view showing the housing of the connector of the second embodiment in the present invention together with the comparative example housing **610** shown in FIG. **4**A. FIG. **5**A shows the comparative example housing **610**, and FIG. **5**B shows the housing **210** of the second embodiment of the present invention. Also, regarding components of FIG. **5** equivalent to components shown in FIG. **4**, the same reference number as components of FIG. **4** are designated, and explanation of the same components as FIG. **4** is omitted.

As shown in FIG. **5**B, in the housing **210**, one receiving chamber group **112** and the other receiving chamber group **112** are placed opposite to each other with a space in a vertical direction of FIG. **5**. Further, the axis **111***c* (see FIG. **2**) of the terminal receiving chamber **111** of the one receiving chamber group **112** and the axis of **111***c* of the terminal receiving chamber **111** of the other receiving chamber group **112** are dislocated in the horizontal direction of FIG. **5** perpendicular to an opposing direction. For this reason, the terminal receiving chamber **112** is arranged so that the terminal receiving chambers **111** located in the center of the housing **210** are arranged in a zigzag alignment (dashed line L**1**) in the horizontal direction with a space between the receiving chamber groups. As a result, a space W**5** between the receiving chamber groups **112** in the width direction (namely, the vertical direction in FIG. **5**) of the zigzag alignment can be reduced as mentioned below.

As shown in FIG. **5**A, in the housing **610** of the comparison example, a space W**3** between the terminal receiving chamber **612** provided at two stages in an upper side of FIG. **5**A and the terminal receiving chamber **612** provided at two stages in a lower side of FIG. **5**A is provided so that spaces Ar**2** for separating the terminal receiving chambers **612** in the vertical direction are sandwiched between them. On the other hand, in the housing **210** of the second embodiment, the terminal receiving chambers **111** provided in the center is arranged in zigzag arrangement as mentioned above. For this reason, the terminal receiving chambers **111** provided in an upper side

and lower side are arranged so as to deviate in the horizontal direction. As a result, in the housing **210** of the second embodiment, the above space Ar**2** can be narrowed, and the space W**5** between the receiving chamber groups **112** in the width direction (vertical direction in drawing) of the zigzag arrangement is reduced than the space W**3** shown in FIG. **5**A. Further, in the housing **210** of the second embodiment, the space W**2** between the terminal receiving chambers **111** in the horizontal direction is narrowed than the space W**1** shown in FIG. **4**A as with the first embodiment described above. The housing **210** of the second embodiment can reduce the spaces W**2** and W**5** between the terminal receiving chambers **111** in the vertical and horizontal directions, and thereby the housing **210** can be more downsized. As a result, the connector can be more miniaturized.

In the embodiments of the present invention, a substrate mounting type of connector is considered as a mating connector. FIG. **6** is a view showing the substrate mounting type of connector which is fitted to the connector of the second embodiment. FIG. **7** is a view seeing the substrate mounting type of the connector shown in FIG. **6** from a substrate side. The connector **200** of the second embodiment is fitted to the substrate mounting type of the connector **700** shown in FIGS. **6** and **7** in a fitting direction being the in-plane direction of the substrate **750** as shown with an arrow D**2** in FIG. **6**.

In the substrate mounting type of the connector **700**, one side of a male terminal **710** is fitted to the round terminal **120** in the connector **200** of the second embodiment, and an opposite side thereof is a connecting pin **711** connected to a substrate **750**. The connecting pin **711** extends parallel to the substrate **750**, and is bent at 90 degrees. Furthermore, the connecting pin **711** is connected to the substrate **750**. As a result, the substrate **750** has an occupied space required for connection of the connecting pin **711** in the substrate mounting type of the connector **700**. In this case, as shown in FIG. **5**B, according to the connector **200** of the second embodiment that the axes **111***c* of the terminal receiving chamber **111** provided in two stages and disposed opposite to each other are arranged shifted in the horizontal direction and located in a zigzag arrangement, the occupied space on the substrate **750** of the substrate mounting type of the connector **700** can be reduced as mentioned below.

FIG. **8** is a view showing a state that the occupied space on the substrate in the substrate mounting type of the connector shown in FIGS. **6** and **7** is narrowed by the arrangement of the terminal receiving chamber in the connector fitted to the connector. FIG. **8**A shows the housing **610** of the comparison example shown in FIG. **5** and the occupied space Ar**3** on the substrate **760** required in the comparison example. Further, FIG. **8**B shows the housing **210** of the second embodiment shown in FIG. **5** and the occupied space Ar**4** on the substrate **750**.

As shown in FIG. **8**A, when the terminal receiving chambers **611** are arranged in a lattice point viewing from the axis direction, the mating male terminals in the substrate mounting type of the connector are also arranged in lattice points. Furthermore, the connecting pins extend parallel to each other, and are connected to the substrate **760**. For this reason, the connecting points **761** on the substrate **760** are arranged in lattice points. Furthermore, the occupied space Ar**3** of the width W**6** according to the arrangement is occupied on the substrate **760**.

On the other hand, in the connector **200** of the second embodiment, as shown in FIG. **8**B, the horizontal direction parallel to the substrate **750** when fitted to the mating connector is adopted as a direction shifting the terminal receiving chamber **111**. As a result, as shown in FIG. **7**, the terminal of the horizontal direction in the substrate mounting type of the connector **700** can be arranged in a zigzag arrangement so that the terminals provided in the center of the housing are arranged shifted in the horizontal direction as with the terminal receiving chamber **111** of the second embodiment. The zigzag arrangement is a series arrangement of two rows facing each other, however the arrangement of the connecting points **751** on the substrate **750** in the horizontal direction can be arranged side by side in a row without a space in the vertical direction. As a result, the width W**7** of the occupied space Ar**4** on the substrate **750** can be reduced with a ½ of the occupied space Ar**3** in the comparison example. Therefore, according to the second embodiment, it is possible to narrow the occupied space Ar**4** on the substrate **750** to the half of the occupied space Ar**3** in the comparison example.

The illustrated two embodiments of the present invention have been described for illustrative purposes only, and not by way of limiting the invention. Accordingly, the present invention can be implemented with various modifications made thereto within the scope of the present invention.

For example, in the above two embodiments, the quadrangular housings **110**, **210** are shown as one example of the housing of the present invention. However, the housing of the present invention is not limited. For example, it may be formed in an arbitrary shape.

Furthermore, for example, in the above two embodiments, as one example of the housing of the present invention, the housings **110** and **210** which arrange the receiving chamber group **112** of two rows in the vertical and horizontal directions with a total of four groups are illustrated. However, the housing of the present invention is not limited thereto. Such as, one of the receiving chamber group may be provided, and a plurality of the receiving chamber groups other than four groups may be provided.

Furthermore, for example, in the above two embodiments, as one example of the receiving chamber group of the present invention, the receiving chamber groups **112** are illustrated. In the receiving chamber groups **112**, four terminal receiving chambers **111** are arranged side by side so that the axes **111***c* are positioned at a vertex of the square Sg**1**, respectively. However, the receiving chamber groups of the present invention are not limited. For example, four terminal receiving chambers may be arranged side by side so that the axes are positioned at a vertex of a rectangle.

REFERENCE SIGNS LIST

100, **200** connector
110,**210** housing
111 terminal receiving chamber
111*a* fitting hole
111*b* insertion/extraction hole
112 receiving chamber group
113 flexible lance
113*a* fixed end
113*b* free end
113*c* locking portion
114 lance body
120 round terminal (an example of terminal)
121 large-diameter portion
122 small-diameter portion
123 step

What is claimed is:

1. A connector comprising:

a terminal including a large-diameter portion and a small-diameter portion formed in cylindrical shape and continued in an axial direction; and

a housing for receiving a plurality of the terminals,

wherein the housing has:

a receiving chamber group including four terminal receiving chambers extending from one end of the housing toward the other end thereof and in which the terminal is inserted with the large-diameter portion as a leading end from an opening provided in the other end; and

a lance body arranged to be surrounded by the four terminal receiving chambers,

wherein each of the four terminal receiving chambers of the receiving chamber group is arranged so that each axis of the terminal receiving chambers is parallel to each other and is located on four vertexes of a square or rectangle when viewing from the axis direction,

wherein the lance body is arranged corresponding to each the four terminal receiving chambers and integrally has four flexible lances extending in a longitudinal direction of the terminal receiving chamber, one end of each the flexible lance is formed to be a free end in the one end of the housing,

wherein each the four flexible lances has a locking portion projecting into an inside of the terminal receiving chamber so as to be locked on a step between the large-diameter portion and the small-diameter portion in the terminal received in the corresponding terminal receiving chamber, and

wherein each the four flexible lances is located in a diagonal line of the square or rectangle so that the free end is bent in a diagonal direction of the square or rectangle and the locking portion is locked or unlocked on the step when the terminal is inserted in the terminal receiving chamber or extracted therefrom.

2. The connector according to claim **1**, wherein the free end of the flexible lance extends toward the one end of the housing beyond the step, and supports the large-diameter portion in the diagonal direction.

3. The connector according to claim **1**, wherein a plurality of the receiving chamber groups are provided,

one of the plurality of the receiving chamber groups and the other of the plurality of the receiving chamber groups are arranged opposite to each other with a space in one direction, and

the axis of the terminal receiving chamber of the one of the plurality of the receiving chamber groups and the axis of the terminal receiving chamber of the other of the plurality of the receiving chamber groups are arranged so as to be shifted in a direction perpendicular to the one direction.

4. The connector according to claim **2**, wherein a plurality of the receiving chamber groups are provided,

one of the plurality of the receiving chamber groups and the other of the plurality of the receiving chamber groups are arranged opposite to each other with a space in one direction, and

the axis of the terminal receiving chamber of the one of the plurality of the receiving chamber groups and the axis of the terminal receiving chamber of the other of the plurality of the receiving chamber groups are arranged so as to be shifted in a direction perpendicular to the one direction.

* * * * *